Sept. 20, 1966 S. DE ORLOW 3,273,429

RATCHET WRENCH

Filed Sept. 30, 1964 2 Sheets-Sheet 1

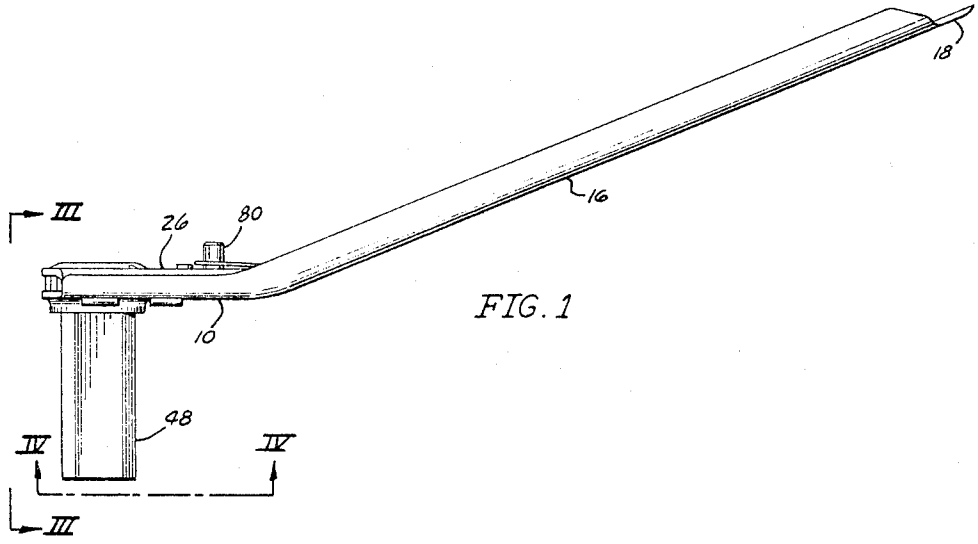


FIG. 1

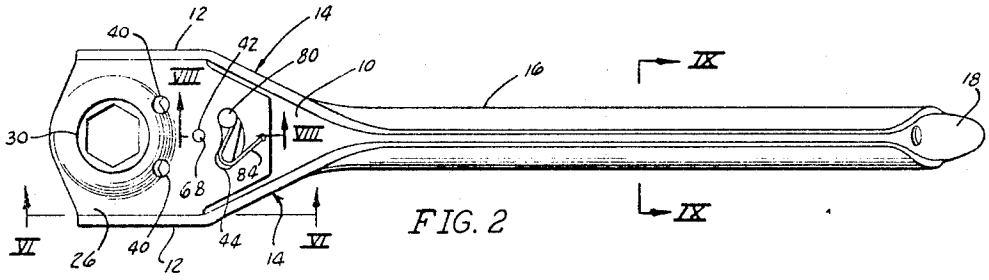


FIG. 2

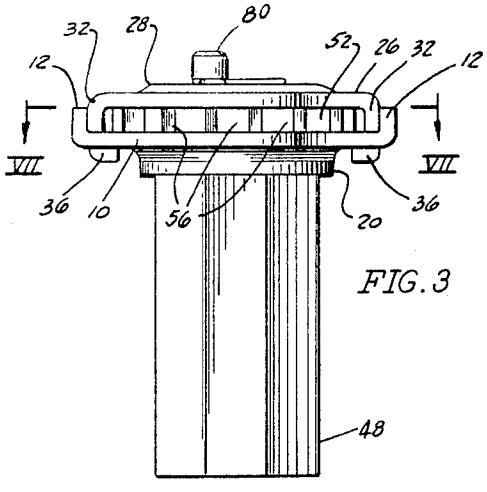


FIG. 3

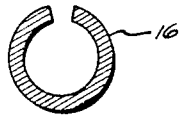


FIG. 9

INVENTOR

STEPHEN DE ORLOW

BY Beaman & Beaman

ATTORNEYS

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RATCHET WRENCH

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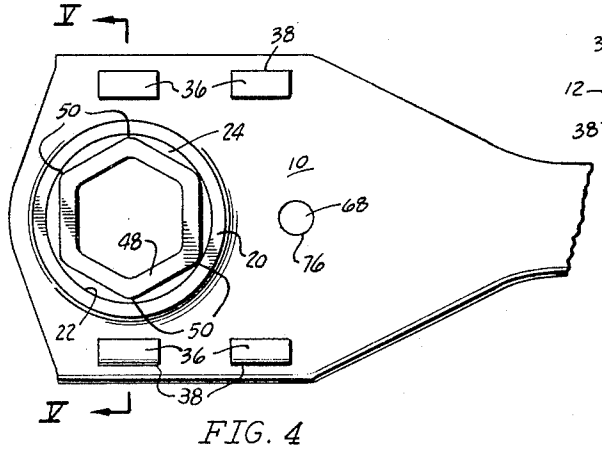


FIG. 4

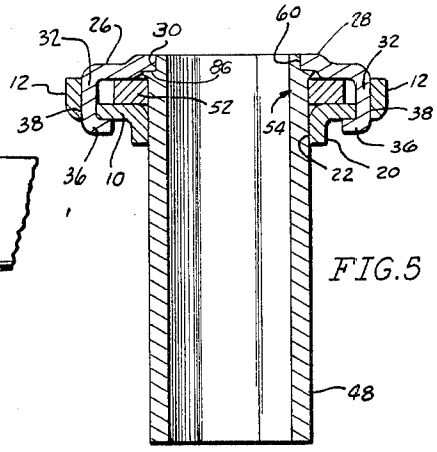


FIG. 5

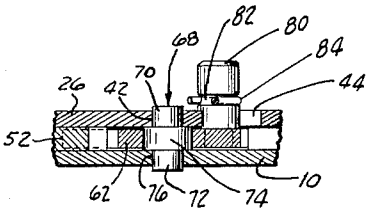


FIG. 8

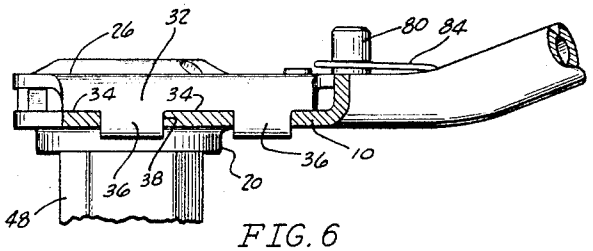


FIG. 6

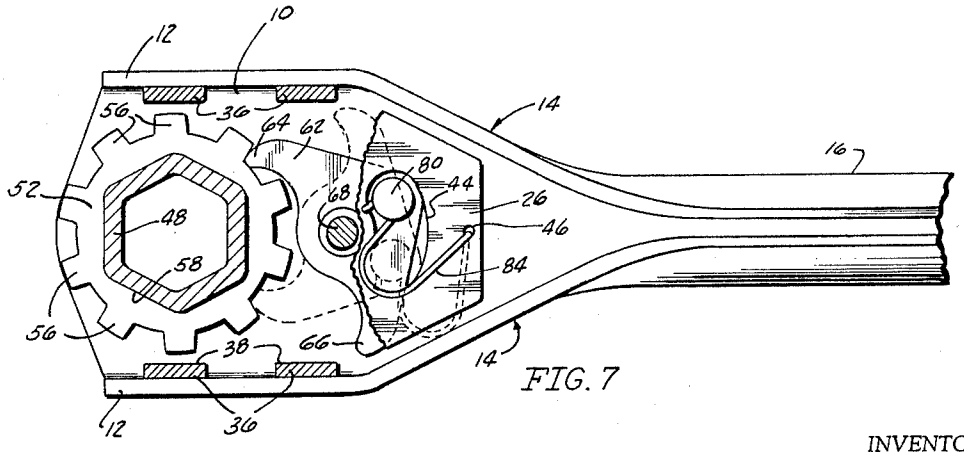


FIG. 7

INVENTOR

STEPHEN DE ORLOW

BY Beaman & Beaman

ATTORNEYS

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3,273,429

RATCHET WRENCH

Stephen De Orlow, Jackson, Mich., assignor to Ryerson & Haynes, Inc., Jackson, Mich., a corporation of Michigan

Filed Sept. 30, 1964, Ser. No. 400,396
6 Claims. (Cl. 81—62)

The invention pertains to a ratchet wrench, and particularly relates to a ratchet wrench of economical construction primarily formed of sheet metal fabricated by stamping operations.

The wrench which is normally provided with vehicles for the purpose of removing the wheel nuts to permit the changing of a tire is normally of the most basic construction, usually incorporating a hexagonal-shaped socket rigidly affixed to the end of a handle member. Rotation of the socket is produced by rotating the handle member. The use of such "fixed handle" wrenches often becomes difficult when attempting to remove those wheel nuts which are closest to the ground, in that the handle often engages the ground preventing rotation of the wrench. Upon such occurrence the wrench must be removed from the nut and reinserted thereon after the handle has been repositioned. The use of a ratchet wrench wherein the nut receiving socket member is rotatably mounted on the handle and is able to ratchet thereto eliminates the above-mentioned problem. However, in that a ratchet wrench employs movable parts and is considerably more complicated than the simple "fixed handle" wrench, such wrenches have not been heretofore provided as usual equipment with vehicles due to their cost.

It is a basic object of the invention to provide a ratchet wrench of unusual economical manufacture which is of a rugged, high strength construction.

An additional object of the invention is to provide a ratchet wrench capable of permitting the socket portion to ratchet in either direction wherein the wrench is primarily formed of sheet metal stamped components and is fabricated and assembled from a minimum number of components to provide a most economical assembly.

Another object of the invention is to provide a ratchet wrench primarily formed of stamped sheet metal components which is of a high strength construction capable of providing a long effective service life.

An additional object of the invention is to provide a ratchet wrench construction primarily formed of sheet metal components wherein the sheet metal components are associated as to provide maximum strength characteristics, the components including homogeneously formed bearing surfaces for the rotatable socket member which may be readily formed from the sheet material without causing significant additional costs.

A further object of the invention is to provide a ratchet wrench construction which is feasible for vehicle wheel use having a handle which may be used to operate a jack and remove a hub cap.

These and other objects of the invention arising from the details and relationships of the components of an embodiment thereof will be apparent from the following description and accompanying drawings wherein:

FIG. 1 is an elevational view of a ratchet wrench constructed in accord with the invention,

FIG. 2 is a plan view of the ratchet wrench of FIG. 1,

FIG. 3 is an end view of the ratchet wrench as taken along section III—III of FIG. 1,

FIG. 4 is a bottom, enlarged, detail view of the ratchet wrench head as taken along section IV—IV of FIG. 1,

FIG. 5 is an elevational, sectional view taken through the socket member along section V—V of FIG. 4,

FIG. 6 is an enlarged, detail, sectional, elevational view as taken along section VI—VI of FIG. 2,

FIG. 7 is a plan, enlarged, detail, sectional view taken along section VII—VII of FIG. 3, a portion of the plate being retained to indicate the ratchet dog adjustment pin position during various positions of the dog, the dog being shown in one operative position in full line and in the other operative position in dotted lines,

FIG. 8 is an enlarged, elevational, detail, sectional view of the dog and pivot pin taken along section VIII—VIII of FIG. 2, and

FIG. 9 is an elevational, sectional view through the handle taken along section IX—IX of FIG. 2.

The basic member of the ratchet wrench, in accord with the invention, is the body member **10** which is formed of a sheet metal that is of a substantially planar configuration, having lateral side portions. The lateral side portions are parallel to each other, FIGS. 2 and 7, and are disposed upwardly from the central planar portion to define flanges **12**.

The body member **10** is so formed that the flanges **12** converge toward one another at **14**, FIG. 2, and together with the narrowing portion of the planar portion **10**, emerge to define a handle **16** angularly disposed to the plane of the body member portion **10**, FIG. 1. The cross-sectional configuration of the handle **16** may be that of a channel, if desired. However, in the illustrated embodiment, the flanges **12** are so formed in the handle portion to define a handle of a substantially cylindrical configuration, as will be apparent from FIG. 9. Such a cylindrical configuration permits the end of the handle to be inserted into the cylindrical socket usually defined in vehicle bumper jacks to permit operation of the jack. The outermost end of the handle may be formed, as will be apparent from FIGS. 1 and 2, to define a spade configuration **18** whereby the spade may be used to remove vehicle tire covers or hub caps.

The body member **10** is pierced substantially centrally to define a circular flange **20** extending from the opposite side of the plane of the body member than that in which the flanges **12** extend. The flange **20** defines an inner cylindrical bearing surface **22** forming an opening **24** for receiving the socket member, as will be later appreciated. It will be noted that the flange **20** extends a significant distance from the plane of the body member **10** to provide an adequate bearing surface.

A plate **26** is affixed to the body member **10**. The plate **26** includes a generally planar central portion having a raised portion **28**, FIG. 5, defined therein in which a circular opening **30** is defined. The opening **30** is coaxially related to the body member opening **24** and flange **20**. The parallel lateral sides **32** of the plate **26** define flanges which extend at right angles to the central planar portion of the plate and include spacing location surfaces **34** and projections **36** which extend beyond the location surfaces. In the disclosed embodiment, four rectangular openings **38** are defined in the body member **10** just "inside" of the flanges **12**, FIG. 7. The projections **36** are received within the rectangular openings **38** and are of sufficient length to permit the ends of the projections to be bent over into engagement with the underside of the planar portion of the body member **10**, as will be apparent from FIGS. 3 and 5. The locating surfaces **34** engage the body and thereby determine the spacing between the plate and the body member. In this manner the plate location surfaces **34** maintain the planar portions of the body member and plate in a spaced, parallel relation, and the deformed projections **36** firmly attach the plate to the body member.

The configuration of the plate **26** will be best observed from FIG. 2 wherein a pair of holes **40** are defined in the

plate for permitting observation of the relationship of the ratchet wheel and dog, as will be described. A pivot pin hole **42** is defined in the plate **26** and an arcuate opening **44** is defined therein for receiving the dog operating pin. A spring anchor hole **46** is also defined in the plate.

The socket member **48** of the ratchet wrench is preferably formed of a piece of hexagonal tubing having an internal hexagonal configuration which receives the nut with which the wrench is to be associated. The dimension of the flange cylindrical bearing surface **22** is related to the outer dimension of the socket member whereby the ridges **50** of the socket member engage the cylindrical surface **22** to permit rotation of the socket therein.

A planar ratchet wheel **52** is affixed to the inner end **54** of the socket member and is interposed between the body member **10** and the plate **26**. The ratchet wheel **52** is provided with a plurality of teeth **56** about its circumference and is internally formed with a hexagonal bore **58** adapted to closely fit on the socket member **48**. The ratchet wheel **52** may be swaged, brazed, welded, or press-fitted to the inner end of the socket member. In the illustrated embodiment, the ratchet wheel **52** is swaged on the socket member head and, preferably, is also brazed thereto.

The innermost end of the socket member **48** is machined to provide a cylindrical bearing surface **60** adapted to closely cooperate with the plate opening **30** whereby the opening **30** and surface **60** function as bearing surfaces, permitting rotation of the socket member. It will, therefore, be appreciated that the socket member **48** is supported for rotation upon the body member **10** and the plate **26** by means of the "bearing surfaces" **22** and **30**.

Operation of the socket member relative to the body member is controlled by a dog **62** having end portions **64** and **66** adapted to selectively engage the ratchet wheel teeth **56**. The selective engagement of the end portions **64** and **66** is dependent on the desired direction of rotation of the socket member **48**. The dog **62** is pivotally mounted intermediate the body member and the plate by means of a pivot pin **68**, having reduced end portions **70** and **72** and an intermediate enlarged cylindrical portion **74**. The lower portion **72**, FIG. 8, is received within a cylindrical hole **76** defined in the body member **10** and the upper portion **70** is received within the plate hole **42**. The configuration of the pin **68** thereby maintains the pin in the assembly.

A dog-operating pin **80** is affixed to the dog centrally between the ends **64** and **66**, offset with respect to pin **68**, and extends through the arcuate plate opening **44**. The pin **80** is provided with an angular groove **82** which receives the formed end of a spring **84** having its other end received within the plate hole **46**. The configuration of the spring **84** and the dimensional relationships between the pin **80**, pivot pin **68**, and the hole **46** are such as to provide a snap action of the dog as it is moved from the full-lined position to the dotted-line position of FIG. 7 and back. These two positions indicate the two operating positions of the dog and the position of the end of the dog engaged with the teeth **56** may be observed through openings **40**.

The high strength characteristics of the ratchet wrench, even though formed of sheet stamped material, are produced by the use of the flanges **12** and **32**, the flange **20**, the raised portion **28** and the interrelation between the parts. For instance, note that the plate flanges **32** are closely received, and engage, within the body member flanges **12** and, thus, the interaction between the flanges **12** and **32** prevents rotation of the plate **26** relative to the body member **10**, as well as does the reception of the projections **36** within the plate member openings **38**. The fact that the spacing between the body member **10** and the plate **26** substantially corresponds to the thickness of the ratchet wheel **52** permits the ratchet wheel to prevent "cocking" of the socket member **48** relative to the body member and, thus, the ratchet wheel functions as a thrust bearing to resist axial forces which may be imposed upon the socket member. Also, the radial socket member shoulder **86** which engages the inside of plate **26** adjacent opening **30** will function as a thrust bearing. The flange cylindrical surface **22** and the opening **30** function as economical, but effective, bearing surfaces which are capable of rotatively supporting the socket member during its normal service life. By employing the enlarged pivot pin portion **74**, the use of cotter keys or other components is eliminated to maintain the desired assembly of the pivot pin on the wrench. As the socket member **48** may be formed of conventional or readily available tube stock and as the other components are primarily formed of stampings which may be economically produced, it is possible to provide a most economical ratchet wrench capable of providing rugged service for extended periods of time.

It is appreciated that modifications to the invention may be apparent to those skilled in the art without departing from the spirit and scope thereof, and it is intended that the invention be defined only by the scope of the following claims.

What is claimed is:

1. A ratchet wrench primarily formed of stamped sheet components comprising, in combination:
   (a) a substantially planar body member having first and second sides and spaced flanges depending from said body member in the direction of said first side defining lateral edges of said body member, a plurality of fastener receiving openings defined in said body member,
   (b) an opening defined in said body member,
   (c) a plate affixed to said body member including a generally planar portion disposed in spaced, substantially parallel relation to said body member first side, said plate including spaced lateral side portions deflected transversely from the plane of said planar portion extending toward said body member, body member engaging surfaces defined on said lateral side portions engaging said body member first side and maintaining the spacing of said plate and body member, projections extending from said lateral side portions beyond said body member engaging surfaces and received within said fastener receiving openings, said projections being deformed into engagement with said second body member side, said plate lateral side portions being closely received between and engaging said body member flanges,
   (d) a socket member rotatably received within said opening having an inner end located intermediate said body member and said plate,
   (e) a toothed ratchet wheel permanently affixed to said socket member inner end disposed intermediate said body member and said plate, said wheel being of greater diametrical dimension than said opening and of a thickness slightly less than the spacing between said plate planar portion and said body member first side,
   (f) a ratchet dog located between said body member and said plate adapted to engage said ratchet wheel,
   (g) pivot means extending between said body member and said plate pivotally supporting said ratchet dog, and
   (h) handle means affixed to said body member.

2. A ratchet wrench primarily formed of stamped sheet components comprising, in combination:
   (a) a substantially planar body member formed of sheet material having first and second sides, a plurality of fastener receiving openings defined in said body member,
   (b) a pierced circular opening defined in said body member,
   (c) a cylindrical flange defining the circumference of said pierced opening, said flange projecting from said

body member second side having an axis substantially perpendicular to said planar body member and formed from the material of said body member,

(d) a plate formed of sheet material affixed to said body member including a generally planar portion disposed in spaced, substantially parallel relation to said body member first side, said plate including lateral side portions deflected transversely from the plane of said planar portion extending toward said body member, body member engaging surfaces defined on said lateral side portions engaging said body member first side and maintaining the spacing of said plate and body member, projections extending from said lateral portions beyond said body member engaging surfaces and received within said fastener receiving openings, said projections being deformed into engagement with said second body member side,

(e) a socket member rotatably received within said circular opening having an inner end located intermediate said body member and said plate and an outer surface rotatably supported and guided by said opening flange, said flange serving as a bearing for said socket member,

(f) a toothed ratchet wheel permanently affixed to said socket member inner end disposed intermediate said body member and said plate, said wheel being of greater dimetrical dimension than said opening and of a thickness slightly less than the spacing between said plate planar portion and said body member first side,

(g) a ratchet dog located between said body member and said plate adapted to engage said ratchet wheel,

(h) pivot means extending between said body member and said plate pivotally supporting said ratchet dog, and

(i) handle means affixed to said body member.

3. In a ratchet wrench as in claim 2 wherein:

(a) said body member includes lateral side flange portions transversely deflected from the plane of said body member on a common side thereof, said plate side portions being received between said body member side flange portions and contiguously disposed thereto.

4. A ratchet wrench primarily formed of stamped sheet components comprising, in combination:

(a) a body member of sheet material having first and second sides,

(b) a cylindrical flange defined on said body member from the material thereof projecting from said second side thereof defining an internal cylindrical bearing surface forming an opening in said body member,

(c) a plate formed of sheet material affixed to said body member in spaced relation to said first side thereof,

(d) an elongated, hexagonal tube having hexagonal inner and outer surfaces defining a socket member rotatably received within said body member opening, said tube outer surface adapted to rotatably engage said cylindrical bearing surface,

(e) a toothed ratchet wheel having a hexagonal bore and permanently affixed to and circumscribing said socket member inner end disposed intermediate said body member and said plate, said wheel being of greater diametrical dimension than said opening,

(f) a circular opening defined in said plate coaxial with said body member opening,

(g) a cylindrical bearing surface defined on said socket member inner end rotatably received within said circular plate opening,

(h) a ratchet dog located between said body member and said plate adapted to engage said ratchet wheel,

(i) pivot means extending between said body member and said plate pivotally supporting said ratchet dog, and

(j) handle means affixed to said body member.

5. A ratchet wrench primarily formed of stamped sheet components comprising, in combination:

(a) a body member of sheet material having first and second sides,

(b) a cylindrical flange defined on said body member from the material thereof projecting from said second side thereof defining a cylindrical bearing surface and an opening in said body member,

(c) a plate formed of sheet material affixed to said body member in spaced relation to said first side thereof,

(d) a noncircular, tubular socket member rotatably received within said opening and of a cross section having inner and outer surfaces corresponding to the configuration of the member with which the wrench is to be employed, an inner end defined on said socket member located intermediate said body member and said plate, said socket member outer surface adapted to rotatably engage said cylindrical bearing surface,

(e) a ratchet wheel having a bore and a circumference, teeth defined on said circumference, said bore corresponding in configuration to the exterior configuration of said socket member and permanently affixed upon the inner end thereof intermediate said body member and said plate, said wheel being of greater dimension than said opening,

(f) a circular opening defined in said plate coaxial with said body member opening,

(g) a cylindrical bearing surface defined on said socket member inner end rotatably received within said circular plate opening,

(h) a ratchet dog located between said body member and said plate adapted to engage said ratchet wheel,

(i) pivot means extending between said body member and said plate pivotally supporting said ratchet dog, and

(j) handle means affixed to said body member.

6. In a ratchet wrench as in claim 5 wherein:

(a) said socket member is of a hexagonal cross section and said ratchet wheel bore is hexagonal.

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WILLIAM FELDMAN, *Primary Examiner.*

G. WEIDENFELD, *Assistant Examiner.*